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GEOLOGICAL SURVEY OF ALABAMA

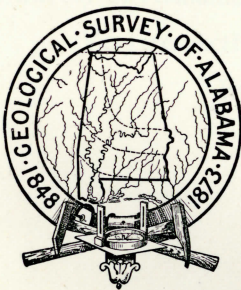
EUGENE ALLEN SMITH, *State Geologist*

BULLETIN No. 16.

Its STATISTICS OF THE MINERAL " PRODUCTION OF ALABAMA FOR 1914

COMPILED FROM MINERAL RESOURCES OF THE
UNITED STATES

By
EUGENE A. SMITH



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LETTER OF TRANSMITTAL.

UNIVERSITY, ALA., December, 1915.

HON. CHARLES HENDERSON,
Governor of Alabama,
Montgomery, Ala.

SIR:—I have the honor to transmit herewith the manuscript of a Report on the Mineral Production of Alabama for the year 1914 with the request that it be printed as Bulletin No. 16 of the Geological Survey of Alabama.

Very respectfully,

EUGENE A. SMITH,
State Geologist.

GEOLOGICAL CORPS.

Eugene Allen Smith, Ph. D.-----State Geologist
William F. Prouty, Ph. D.-----Chief Assistant
Robert S. Hodges-----Chemist
Herbert H. Smith-----Curator of Museum
Roland M. Harper, Ph. D.-----Botanist
A. T. Donoho-----Stenographer
Geo. N. Brewer-----Field Assistant

RIVER GAGE HEIGHT OBSERVERS.

C. J. Stowe-----Jacksons' Gap, Tallapoosa River
J. E. Whitehead-----Riverside, Coosa River
S. T. Dillard-----Beck, Conecuh River
Ed. Bullen-----Red Bay, Big Bear Creek

From the records of daily observations of the gage readings at these places when extended through sufficient time, the calculations of available horsepower to be obtained from the different streams is made.

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PREFACE.

The statistics of all the minerals included in the following pages have been collected in cooperation with the United States Geological Survey, and have been compiled from advance chapters of the *Mineral Resources of the United States*, a publication of the Federal Survey.

The introductory and general matter in each of these articles has either been taken without change from the U. S. advance chapters or has been rearranged or condensed from these chapters, or entirely rewritten to suit it for our present purposes. In each case credit is given to the author.

INTRODUCTION.

EUGENE A. SMITH

AN INSPECTION of the subjoined table will show that there has been a decided decrease in the value of all the mineral products of Alabama in 1914 except cement, gold and silver, graphite and stone, (including marble). The statistics also show that there has been a corresponding decrease in the value of the mineral products of the United States as a whole.

In Bulletin No. 15 of the Alabama Geological Survey,—Statistics of Mineral Production in the State in 1913,—there is an admirable general discussion by Mr. E. W. Parker of the U. S. Geological Survey, of the Mineral Production of Alabama from the early days to the year 1913, along with specific details of the production in 1912 and 1913.

Following the plan thus set out by Mr. Parker, we pass in review the production in 1913 and 1914 of Alabama minerals and their immediate derived products, taking them up somewhat in the order of their commercial importance.

Coal.—Alabama's production of coal in 1914 was 15,593,422 short tons, valued at \$20,849,919, a decrease of 11.8 per cent in quantity and 9.68 per cent in value in 1914 as compared with 1913. As in 1913 the value of the coal product of Alabama in 1914 is approximately two-thirds that of the total mineral output.

Coke.—The coke production of Alabama decreased from 3,323,664 short tons valued at \$9,627,170 in 1913, to 3,084,149 tons valued at \$8,408,443 in 1914, a decrease in value of \$1,218,727 or 12.66 per cent.

Iron Ore and Pig Iron.—While there was in 1914 a decrease of 7.22 per cent in quantity of the total iron ore production, and of 10.71 per cent in the quantity of the Hematite, there was an increase in the quantity of brown ore, of 10.83 per cent. In the quantity of pig iron marketed in Alabama in 1914 there was a decrease from 1913 of 13.68 per cent and a decrease in the value of 24.78 per cent.

The value of this iron ore production and not the value of the pig iron is used in making up the total value of the mineral products of the State.

The total value of the mineral production of Alabama, excluding the value of the pig iron and coke and including the value of the iron ores, was \$30,879,288 in 1914, compared with 34,660,545 in 1913, of which, as already stated, approximately two-thirds is represented by the output of the coal mines. Nearly one-fifth of the total value was contributed by the iron mines. The decrease in 1914 from 1913 was \$3,781,257, or 10.9 per cent.

The principal coal producing counties are Jefferson, Walker, Bibb, Tuscaloosa and St. Clair in the order named. The principal iron ore counties are Jefferson, Tuscaloosa, Franklin and Etowah. The combined value of the pig iron and coke made in Alabama approximates \$26,000.00. These values are not included in the total as they are represented in the value of the iron ore and coal produced.

Clay-Working Industries.—These industries yielded products in 1914, valued at \$1,574,023 against \$2,091,581, in 1913, a decrease of \$17,558, or nearly 25 per cent. This does not include the value of the raw clay sold, which in 1914 amounted to \$34,607, a decrease from 1913 of 35.03 per cent.

The center of the clay-working industry is Jefferson county, and Birmingham furnishes the principal market. Vitrified, front and fire brick represent a value of \$495,398 or 77.7 per cent of the value of the common brick, while the total output of the brick yards makes up over 72 per cent of the State's total clay products. All of the fire brick is reported from Jefferson county and all of the vitrified brick is from Jefferson and St. Clair counties. Clay pits for the manufacture of common brick have been opened in one or more places in 30 different counties.

Stone.—The quarry products, the larger part of which is limestone, were valued in 1914 at \$1,319,753, an increase of 2.63 per cent from \$1,285,944 in 1913.

The increased production in 1914 was in the output of limestone for rough building stone, road making, concrete and for agricultural purposes; for sandstone used in Government works on the Warrior River, and the production of marble.

Over 87 per cent of the total value of the stone production is limestone. Its most important uses are for furnace flux, concrete, road making, for building purposes and for agricultural uses. While heretofore comparatively little of the Ala-

bama limestone was used for building purposes, there has been in 1914 a remarkable increase, 119.5 per cent along this line. In the production of marble there has also been a notable increase in 1914. The reader is referred to the body of this Bulletin under Stone for further details concerning especially the building stone and marble industries.

Marble holds the second place in the value of quarry products, a beautiful white marble occurring in Coosa and Talladega counties being extensively used for building (both inside and outside work), and a black marble which gives promise of future development, has been prospected near Anniston and near Piedmont.

Cement.—The cement production of Alabama amounted in 1914 to 777,698 barrels, valued at \$746,555, as against 823,246 barrels in 1913 valued at \$685,422, a decrease of 5.53 per cent in quantity but an increase in value of 8.92 per cent.

Lime.—The lime production is not included in that of the limestone, and amounted to 46,966 short tons, a decrease from 1913 production of 28,502 short tons, or 37.77 per cent. The value of the product was \$199,814, a decrease of \$90,580 or 31.19 per cent.

Graphite.—The Alabama graphite is all of the crystalline variety, and the value of the product in 1914 was \$118,000 as against \$87,336 in 1913, an increase of 35.88 per cent. The Alabama production for 1914 was 41.35 per cent of the total value of the crystalline graphite produced in the United States, and 36.46 per cent of the total value of amorphous and crystalline combined. The great increase in production in 1914, and the installing of a number of new plants, not in active operation during 1914, makes it probable that the Alabama production in 1915 and following years will represent an even larger proportion of the U. S. total value.

Minor Products.—Alabama produces a small quantity of gold and silver, and other minor products are bauxite, mica, millstones, mineral paints, (natural pigments), mineral waters, natural gas, and sand and gravel.

In the following table is presented a comparison of the mineral output of Alabama in 1913 and 1914. As stated above, the total does not include the value of pig iron or that of coke, but it does include the value of the coal made into coke and of the iron ore sold or used.

Mineral production of Alabama in 1913 and 1914.

	1913				1914			
	Raw		Derived		Raw		Derived	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Barytes, short tons.....	*	*	.....	.....	*	*	.....	.....
Bauxite, long tons.....	.....	.....	.....	.....	.....	.....	.....	.....
Cement, barrels.....	49,901	\$53,419	823,246	\$685,422	*	*	777,698	\$746,555
Clay products, short tons.....	.....	.....	.....	2,091,581	27,973	\$34,607	.....	1,574,923
Coal, short tons.....	17,678,522	23,083,724	.....	.....	15,693,422	20,849,919	.....	.....
Coke, short tons.....	.....	.....	3,323,664	†9,627,170	.....	.....	3,084,149	†8,408,443
Ferro alloys, long tons.....	.....	.....	.....	.....	.....	.....	* †	* †
Gold, fine ounces (troy).....	.....	.....	537	11,094	.....	.....	579	11,970
Graphite, crystalline, pounds.....	2,020,910	87,336	.....	.....	2,410,200	118,000	.....	.....
Iron ore, long tons.....	5,333,218	6,648,569	.....	.....	4,514,926	5,727,619	.....	.....
Iron, pig, long tons.....	.....	.....	1,924,762	†23,242,374	.....	.....	1,861,420	†17,481,828
Lime, short tons.....	.....	.....	75,468	290,394	.....	.....	46,966	199,314
Mica.....	.....	.....	.....	*	.....	.....	.....	*
Millstones.....	.....	.....	.....	*	.....	.....	*	*
Mineral paints, natural pigments, short tons.....	.....	.....	.....	.....	.....	.....	.....	.....
Mineral waters, gallons sold.....	169,687	19,343	.....	.....	169,279	17,125	.....	.....
Natural gas.....	.....	*	.....	.....	.....	*	.....	.....
Sand and gravel, short tons.....	1,405,068	398,088	.....	.....	831,430	262,219	.....	.....
Silver, fine ounces (troy).....	.....	.....	117	71	.....	.....	199	110
Stone.....	.....	†	.....	†1,285,944	.....	†	.....	†1,319,753
Miscellaneous.....	.....	46,618	.....	12,361	.....	42,382	.....	336,325
Total value, eliminating duplications.....	.....	\$34,660,545	.....	.....	.....	\$30,879,288	.....	.....

* Value included under "Miscellaneous." † Value not included in total value. ‡ Stone sold rough included in derived products.

STATISTICS OF THE MINERAL PRODUCTION OF ALABAMA FOR 1914.

ABRASIVES.

EUGENE A. SMITH.

ALABAMA'S production of abrasives is at present limited to a small number of millstones (chasers*) quarried and made at Dutton, Jackson County; there are, however, several materials in different parts of the State which are sufficiently promising to be worth investigation and thorough testing; the nature and locality of these deposits were treated in Bulletin No. 13, which see.

BARYTES.

JAMES M. HILL.

There has been no production of barytes in Alabama since 1906 until 1914, when a small production is reported from Calhoun county. There are other deposits which probably could be worked with profit in Etowah, St. Clair and Bibb counties.

The residual deposits so far worked are associated with the Chickamauga ("Pelham") limestone, of Ordovician age, and the Knox dolomite, of Cambrian and Ordovician age. They

*Chasers are larger than the regular millstones. They are used for heavier work, such as grinding quartz, feldspar, barytes, etc., and they run on edge. Though they are made with a diameter as short as 24 inches, they are usually turned out with diameters ranging from 50 to 84 inches, and are as much as 22 inches in thickness. These chasers are run on pans paved with roughly cubical blocks of the conglomerate, with edges about a foot in length. In grinding quartz in such pans the chasers are used in the preliminary crushing; then rough blocks, usually three in number, are either attached to or carried along by lateral arms, which in turn are joined to a vertical revolving shaft. By the circular movement of these blocks the material placed in the pan is ground to powder.

There were 14 operators in New York in 1912. One quarry was reported idle during the year and one former operator has gone out of business.—Frank J. Katz.

seem to be localized along lines of folding and faulting of the rocks, particularly along the eastern side of the Appalachian fold. The barytes probably occurred originally as veins and replacements along fissured or fractured dolomite. Solution of the dolomite has left the insoluble barium sulphate in nodules and boulders in the residual clay.

CHARACTER OF BARYTES.

Barytes, or heavy spar (BaSO_4), is composed of 65.7 per cent barium oxide (BaO) and 34.3 per cent of sulphur trioxide (SO_3). The specific gravity of the mineral ranges from 4.3 to 4.6; its hardness varies from 2.5 to 3.5. It is usually a white opaque to translucent crystalline mineral about as hard as calcite, but it differs from calcite in its greater specific gravity and in the fact that it is perfectly inert when treated with acids. Some barytes is stained reddish pink or yellow by iron oxide. In its common form it is an aggregate of straight or slightly curved cleavable plates, but it occurs also in granular, fibrous, and earthy masses, and in the form of stalactites, as well as in single and clustered crystals. Natural barytes is rarely pure, its most common impurities being silica, lime, magnesia, and the oxides of iron and aluminum. Fine particles of galena are disseminated through many of the deposits in the United States. The commercial grades of the mineral as mined carry 95 to 98 per cent barium sulphate and 1 to 3 per cent of silica.

USES OF BARYTES.

Barytes is used principally as a pigment in mixed paints, in the manufacture of lithopone—a chemically prepared white pigment consisting of zinc sulphide and barium sulphate—and as a base upon which the lake pigments are precipitated. It is also used in the manufacture of white rubber goods, asbestos cement, and artificial ivory, and in the preparation of fertilizers, boiler compounds, insecticides, peroxide of hydrogen, and artificial driftwood salts. Barium carbonate and some barium chloride are used to prevent efflorescence on bricks; and the carbonate, sulphate, or nitrate is used in the manufacture of rolled glass, hollow glass, crystal and table glass, and in special glasses such as the Jena phosphate crown glass.

BAUXITE.

The production of bauxite in Alabama for 1914 was limited to one producer, which accounts for the decrease and also for the joining of the Alabama and Georgia totals.

The following table gives the production and value of bauxite from 1889 to 1914, inclusive:

Production of bauxite in the United States, 1889-1914, by States, in long tons.

Year	Georgia	Alabama	Arkansas	Total	Value
1889.....	728			728	\$2,366
1890.....	1,844			1,844	6,012
1891.....	3,301	292		3,593	11,675
1892.....	5,110	5,408		10,518	34,183
1893.....	2,415	6,764		9,179	29,507
1894.....	2,050	9,016		11,066	35,818
1895.....	3,756	13,313		17,069	44,000
1896.....	7,313	11,051		18,364	47,338
1897.....	7,507	13,083		20,590	57,652
1898.....				25,149	75,437
1899.....	15,736	14,499	5,045	35,280	125,598
1900.....	19,739		3,445	23,184	89,676
1901.....	18,038		867	18,905	79,914
1902.....	22,677		4,645	27,322	120,366
1903.....	22,374		25,713	48,087	171,306
1904.....	21,913		25,748	47,661	235,704
1905.....	15,173		32,956	48,129	240,292
1906.....	25,065		50,267	75,332	368,311
1907.....				*97,776	480,330
1908.....	14,464		*37,703	52,167	263,968
1909.....	22,227		*106,874	129,101	679,447
1910.....	33,096		*115,836	148,932	716,258
1911.....	30,170		*125,448	155,618	750,649
1912.....	19,587	14,173	*126,105	159,865	768,932
1913.....	27,409		*182,832	210,241	997,698
1914.....	18,547		200,771	219,318	1,069,194

*Production of Tennessee included.

For an outline of the uses of bauxite, see Bulletin No. 13.

The Republic Mining & Manufacturing Co. was the only one that operated in Alabama in 1914. The company worked near Rock Run, Cherokee County, in the eastern part of the State.

CEMENT.

EUGENE A. SMITH.

E. F. BURCHARD.

PUZZOLAN OR SLAG CEMENT.

DURING the past six years only one establishment in Alabama has been engaged in the manufacture of slag cement, using the material from the furnaces about Birmingham. The production is included in the returns for Portland cement and cannot be given separately.

PORTLAND CEMENT.

RESOURCES.

Alabama contains large supplies of limestone, chalk, clay and shale well adapted for Portland Cement manufacture, and widely distributed throughout the State. Coal and labor are abundant and cheap, transportation facilities are excellent, and many of the best limestone and chalk localities are situated on navigable rivers, giving ready access and cheap water transportation to Galveston, New Orleans, Mobile, Charleston, and other ports of the Gulf and Atlantic Coasts. This advantage of location was immensely increased with the opening of the Panama Canal for cement plants located in Alabama are more than a thousand miles nearer to the Isthmus than their nearest possible competitors.

The limestones and shales of the northern part of the State lie so close to each other, and above all so close to the great coal mines which must supply the fuel, that the establishment of Portland Cement plants near the coal mines would give to this industry in Alabama the same advantages which the proximity of the iron ore, the coal, and the stone has given to the iron industry, and which has placed our State beyond competition.

As a Portland cement mixture, ready for burning, consists approximately of 75 per cent lime carbonate and 25 per cent of clayey matter, the material furnishing the lime carbonate is necessarily of more economic importance than that from

which the silica and alumina are derived. In consequence, a Portland cement plant is usually located in the immediate vicinity of a suitable limestone, while the clay or shale required to complete the mixture may be brought some distance.

The limestone formations in North Alabama which can supply the stone adapted for use in cement manufacture are the Trenton or Pelham limestone and the Bangor or Subcarboniferous. In close proximity to both these limestone formations are the shales of the Clinton, Subcarboniferous and Coal Measures.

At the present time there are two cement plants in North Alabama, namely, the Standard Portland Cement Co., located at Leeds in Jefferson County, and the Atlantic & Gulf Portland Cement Co., located at Ragland in St. Clair County. Both of these plants make use of the hard Trenton limestone, and the Standard Cement Co., according to Burchard of the U. S. Geological Survey, uses the shale of the Clinton formation whilst the Ragland Company makes use of the shales of the Coal Measures. Up to the present time no establishment is utilizing the Bangor limestone.

In Middle Alabama the soft, chalky Cretaceous limestone of the Selma Chalk, is the material utilized by the Alabama Portland Cement Co., at Spocari, near Demopolis. The same Company makes use of residual clays overlying and derived from the weathering of the Selma Chalk. During 1914 there was no production reported from the Demopolis plant.

In Southern Alabama the St. Stephens limestone outcropping east and west across the State, furnishes excellent material for Portland Cement manufacture, using either residual clays from decomposition of the limestone, or the clays of the Grand Gulf formation which are almost everywhere in close proximity to the limestone*

The following tables summarize the number of active plants in the United States, and the production of puzzolan cement during the last five years; and the production and value of cement (including puzzolan and Portland) in Alabama in 1913 and 1914:

*Since recent investigations (quoted by Burchard), have shown that limestones containing as much as 10 per cent of magnesia, (MgO), may be used in the manufacture of Portland cement, without detriment to the quality of the cement, the quantity of limestone in Alabama suitable for this manufacture is very greatly increased, over former estimates.—E. A. S.

Statistics of the puzzolan cement industry, 1910-1914.

	1910	1911	1912	1913	1914
Number of plants reporting production:					
Alabama	1	1	1	1	1
Indiana	0	0	0	0	1
New York*		1	1	1	1
Ohio	2	1	1	1	1
Pennsylvania	1	1	1	1	1
Total	4	4	4	4	5
Production in barrels of 330 pounds.....	95,951	93,230	91,864	107,313	68,311
Value of production.....	\$63,286	\$77,786	\$77,363	\$97,663	\$63,358

*Includes production of Collos cement in 1911, 1912, and 1913.

Owing to the fact that there was in Alabama in 1914 only one producer of puzzolan cement, and not more than two operating plants in the Portland cement industry, it is necessary to combine the productions of the two industries in order to avoid publishing figures which were given to the survey in confidence. The tabular results of such a combination are, however, necessarily inconsistent and not to be taken too literally, since the weights per barrel of the two kinds of cement vary.

The total quantity of Portland and puzzolan cement produced in Alabama in 1914 was 777,698 barrels, valued at \$746,555, as compared with 823,246 barrels in 1913, valued at \$685,422, or a decrease in the production of 45,548 barrels, or 5.53 per cent, but an increase in value of \$61,233, or 8.92 per cent.

Below are presented in tabular form the foregoing figures:

*Production and value of cement (including puzzolan and Portland)
in Alabama in 1913 and 1914.*

	No. of Producers	Quantity (Bbls.)	Value	Percentage of total U. S. Value
1913	3	823,246	\$685,422	0.74
1914	3	777,698	746,555	0.93
Decrease and increase.....		-45,548	+61,133	
Percent. of increase and decrease		-5.53	+8.92	

In "Mineral Resources of the United States, for 1914, Part II, (pages 221-259)," the reader, who is interested in the subject, will find a very complete presentation of the cement industries of the United States, by Mr. E. F. Burchard of the U. S. Geological Survey.

CLAY AND CLAY PRODUCTS.

JEFFERSON MIDDLETON AND EUGENE A. SMITH.

CLAY.

CLAY available for the manufacture of clay products is one of the most widely distributed of our minerals. Hence there are clay-working plants scattered over every State and Territory in the Union. Miners of the lower-grade clays are usually also the manufacturers, but as the higher grades of ware are reached, the rule is that fewer and fewer manufacturers are also miners, until in the highest grades of ware the rule is that the manufacturer buys and does not mine the clay he uses. The figures given in the following tables represent clay that is mined and not manufactured by the miner, but is sold as clay. The clay thus sold is small in quantity compared with the total production and includes mainly clay used for high-grade pottery and tile, for paper making, and for refractory products.

The total amount of clay mined in Alabama and sold as such in 1914 was 27,973 short tons, valued at \$34,607. This was a decrease in quantity of 21,928 tons, or 43.93 per cent, and of \$18,662, or 35.03 per cent in value as compared with 1913.

Below is a table giving the production and value of clay mined and sold in Alabama from 1908 to 1914 inclusive, and a comparison of the production of 1913 and 1914.

Production of clay in Alabama from 1908 to 1914 inclusive, and a comparison of the production in 1913 and 1914.

YEAR	Fire Clay		Miscellaneous Clay		Total	
	Quantity Short Tons	Value	Quantity Short Tons	Value	Quantity Short Tons	Value
1908.....	68,289	\$48,983	24,000	\$12,000	92,289	\$60,983
1909.....	45,137	35,345	18,271	5,587	63,408	40,932
1910.....	54,482	32,395	20,600	5,650	75,082	38,045
1911.....	35,203	29,909	.....	.....	35,203	29,909
1912.....	38,552	31,414	4,500	2,000	43,052	33,414
1913.....	49,901	53,269	*	*	49,901	53,419
1914.....	27,973	34,607	.....	.....	27,973	34,607
Decrease 1914..	21,928	18,662	.....	.....	21,928	18,812
Percentage of Decrease.....	43.93	35.03	.....	.....	43.93	35.21

*Not divulged but included in total.

In 1913 the average value of fire clay was \$1.07 per short ton and the fire clay production of Alabama represented 1.21 per cent of the total value of the United States production. In 1914 the average value of Alabama fire clay was \$1.22 per short ton, and the value of the Alabama product was 0.92 per cent of the total value of the fire clay produced in the United States.

CLAY WORKING INDUSTRIES.

ALABAMA, like others of the Southern States, is rich in clays, but its rank as a clay-working State is not very high. In 1914 it was twentieth among the States, with products valued at \$1,574,023, or less than 1 per cent of the total. This was a decrease of \$517,558, or nearly 25 per cent from 1913. Alabama was tenth in the production and value of vitrified paving brick. The principal product was common brick, valued in 1914 at \$638,666 and representing 40.58 per cent of the value of all of Alabama's clay products in that year.

Jefferson County was the principal clay-working county, reporting a production valued at \$1,029,135, or 65.38 per cent of the total value for the State in 1914, a decrease of \$284,297 from 1913. Nearly all of the fire brick produced in the State comes from Jefferson County and fire brick and vitrified brick are its principal clay products. The leading counties in the value of common brick in 1914 were, in the order of their importance, Jefferson, Montgomery, Russell, and Talladega.

Clay products of Alabama, 1910-1914.

Product.	1910	1911	1912	1913	1914
Brick:					
Common—					
Quantity	135,785,000	129,694,000	136,989,000	130,923,000	110,731,000
Value	\$746,961	\$708,903	\$759,409	\$730,148	\$638,666
Average per M	\$5.50	\$5.47	\$5.54	\$5.58	\$5.77
Vitrified—					
Quantity	19,772,000	21,444,000	26,480,000	24,183,000	18,679,000
Value	\$236,516	\$246,707	\$353,303	\$361,722	\$248,525
Average per M	\$11.96	\$11.50	\$13.34	\$14.96	\$13.31
Front—					
Quantity	(*)	9,169,000	10,629,000	(*)	(*)
Value	(*)	\$128,403	\$132,033	(*)	(*)
Average per M	\$15.96	\$14.00	\$12.42	\$15.29	\$11.42
Fancy, value		(*)	(*)		(*)
Fire, value	\$163,672	\$193,375	\$240,434	(*)	\$167,021
Drain tile, value	\$3,773	\$3,777	\$5,465	\$10,802	\$6,838
Sewer pipe, value	(*)	(*)	(*)	(*)	(*)
Fireproofing, value	(*)	(*)	(*)	(*)	(*)
Tile, not drain, value				(*)	
Pottery:					
Red earthenware, value	\$3,475	\$11,243	\$10,990	\$11,164	\$4,800
Stoneware and yellow and Rockingham ware, value	\$16,371	\$14,753	\$11,223	\$8,994	\$11,742
Miscellaneous, value	\$496,791	\$639,941	\$422,322	\$968,751	\$496,431
Total value	\$1,667,559	\$1,947,102	\$1,935,179	\$2,091,581	\$1,574,023
Number of active firms reporting	87	82	74	68	70
Rank of State	22	17	17	16	20

*Included in "Miscellaneous."

BRICK AND TILE.

THE total production of common brick in Alabama in 1914 was 110,731 M, valued at \$638,666. This as compared with the 1913 production, represents a decrease in both quantity and value, of 20,192 M or 15.34 per cent, and of \$91,482, or 12.53 per cent, respectively.

In the case of vitrified brick there was also a decrease in quantity of 5,504 M, or 22.76 per cent, and in value of \$113,197 or 31.29 per cent.

In 1913 the number of producers of fire-brick in Alabama fell below 3, and the quantity and value could not be disclosed. In 1914, however, the production was 8,721 M, valued at \$167,021.

The following table gives a review of the brick and tile industry in Alabama for 1913 and 1914.

Production of brick and tile in Alabama in 1914, not including pottery products.

Kind	Quantity per Thousand	Value	Average Value per Thousand	Percentage of total value of brick and tile	Percentage of total U. S. value
Common brick	110,731	\$638,666	\$5.77	41.01	1.45
Vitrified Brick	18,679	248,525	\$13.31	15.96	1.98
Drain Tile		6,838		0.43	.08
Fire Brick	8,721	\$167,021	\$19.15	10.73	1.01
Miscellaneous		*496,431		31.87	.....
Total.....		\$1,557,481		100.00	1.20

*Includes front brick, fancy brick, sewer pipe, fire-proofing, and silica brick.

Brick and tile production in 1913 and 1914 compared.

Kind	1913			1914			Increase or Decrease in Value	Percentage
	Quantity M	Value	Average Price	Quantity M	Value	Average Price		
Common Brick	130,923	\$730,148	\$5.58	110,731	\$638,666	\$5.77	— \$91,482	12.53
Vitrified Brick	24,183	361,722	14.96	18,679	248,525	13.31	— \$113,197	31.29
Front Brick	*	*	15.29	*	*	*11.42	.....	.....
Fire Brick .....	*	.....	.....	8,721	\$167,021	19.15	.....	.....
Drain Tile .....	.....	10,802	.....	.....	6,838	.....	— \$3,964	36.69
Miscellaneous .....	.....	†968,751	.....	.....	†496,431	.....	.....	.....

*Included in Miscellaneous.

†Includes front brick, fancy brick, sewer pipe, fire proofing, and silica brick.

POTTERIES.

THE pottery industry of Alabama is of relatively small importance, as only the commoner and coarser grades of ware are produced and most of this for local trade only.

Production was reported for 1914 by 13 operators, an increase of 4. The output was valued at \$16,542, a decrease of \$3,616 or 17.94 per cent. The products consisted of red earthen ware and stone ware only. The rank of Alabama in this industry for 1914 is 19.

The following tables show the values of the pottery product in 1914 and a comparison of the production and values for the years 1913 and 1914.

Value of pottery products in 1914.

Kind	Value	Percentage of total Alabama Pottery's Products	Percent- age of total U. S. Value
Red Earthenware	\$4,800	29.02	.45
Stoneware and Rockingham ware.....	\$11,742	70.98	.35
Total.....	\$16,542	100.00	.05

Comparison of pottery products in 1913 and 1914.

Kind	1913	1914	Increase+ or Decrease—	Per- cent- age
Red Earthenware	\$11,164	\$4,800	—\$6,364	57.00
Stoneware and Rockingham ware.....	8,994	11,742	+ 2,748	30.55
Total.....	\$20,158	\$16,542	--\$3,616	17.94

COAL.

E. W. PARKER AND C. E. LESHER.

INTRODUCTORY.

THE great Appalachian coal region which furnishes over two-thirds of the coal production of the United States and which extends from Ohio and Pennsylvania on the north in a gradually narrowing belt through eastern Kentucky and Tennessee has its southern terminus in a considerably broadened area that occupies a large part of the northern half of Alabama. The coal-bearing formations of Alabama underlie about 8,400 square miles and are divided into four distinct basins, the Coosa, the Cahaba, and the Warrior, named from the rivers which drain them, and the Plateau, which includes Blount, Lookout, and Sand or Raccoon Mountains. By far the most important basin in area and in production is the Warrior, which includes all of Walker County, most of Jefferson, Tuscaloosa, and Fayette counties, and smaller parts of Blount, Cullman, Winston and Marion counties. The area known to contain coal is approximately 4,000 square miles, or one-half the total coal area of the State, and contributes about 81 per cent of the total production.

There are several distinct coal groups in the basin, the most important of which are the Brookwood, the Pratt, and the Mary Lee, designated by the names of their principal beds. The Mary Lee group includes the Blue Creek, the Jagger, and the Newcastle beds, most of which are mined in places. The Brookwood, the Pratt, and the Mary Lee produce most of the coking coal mined in the State, and more than half of all of the coal mined in the district.

The Cahaba Basin, second in importance, is a long narrow syncline, 68 miles long and about 6 miles wide, southeast of the Warrior, and occupies parts of St. Clair, Jefferson, Shelby, and Bibb counties. There are many workable beds, and the total quantity of coal in the basin is large. The production is something over 18 per cent of the total for the State.

The Coosa Basin is a deep syncline east of the Cahaba and parallel with it, extending across Shelby and St. Clair counties. It is also long and narrow, 60 miles long by 6 miles wide. It has not been thoroughly explored, but in different parts of the area from two to twelve beds, 3 or more feet in thickness, have been reported.

The Plateau field embraces parts of Blount, Etowah, DeKalb, Cherokee, Marshall, and Jackson counties, and although it has an area underlain by coal four times that of the Cahaba and the Coosa combined, the resources in Alabama are comparatively small. There are four to six beds locally workable. So far as known, the earliest record of the existence of coal in Alabama was made in 1834. The first statement of production in the State is contained in the United States census report for 1840, in which year the production is given as 946 tons. The census report for 1850 does not mention any coal production for the State, and the next authentic record is contained in the census statistics of 1860, when Alabama is credited with an output of 10,200 short tons. The mines of Alabama were probably worked to a considerable extent during the Civil War, but there are no records of the actual production until 1870, for which year the United States census reports a production of 11,000 tons. Ten years later the production had increased to 323,972 short tons, but the development of the present great industry really began in 1881 and 1882, when attention was directed to the large iron deposits near the city of Birmingham

and thus the great "boom" of that city and vicinity was inaugurated. By 1885 the coal production of the State had increased to nearly 2,500,000 tons. Then followed a period of relapse and liquidation, which lasted two years, after which business settled down to a conservative and rational basis and has since developed steadily. In 1902 the coal production of the State reached a total of more than 10,000,000 tons, and reached the maximum of 17,678,522 tons in 1913.

PRODUCTION.

Total production in 1914, 15,593,422 short tons; spot value, \$20,849,919.

The coal production of Alabama decreased 2,085,100 tons, or 11.8 per cent, in quantity and \$2,233,805, or 9.68 per cent, in value in 1914, compared with 1913. The decrease was general throughout the State, only a few counties showing a slight increase. The decrease is attributed to a number of causes, the principal one being the general business depression, which was felt particularly in Alabama because of its importance as an iron-making State, and because the iron interests more than any other branch of the mining industry suffered from the unsatisfactory trade condition. In addition to the demoralization in the iron trade, the disturbed situation in Mexico, resulted in a loss of market for Alabama coke. Alabama coal was also affected by the low price of petroleum in the South-western States; by increased water-power development; by the competition of coal from Kentucky and Illinois in the markets of Louisiana and Mississippi, which are normally supplied by Alabama; and by the smaller bunker trade resulting from the cessation of exports of cotton after the declaration of war in Europe. There was a plentiful supply of labor for coal-mining operations throughout the year, and no shortage of cars for transportation and no serious labor troubles were reported.

The average output of coal per man showed a decrease from 720 tons in 1913 to 649 tons in 1914, but there was a slight increase in the average output per man per day, from 2.82 tons in 1913 to 2.87 tons in 1914. The number of men employed in 1914 was 24,042, who worked an average of 226 days in the year, as compared with 24,552 men in 1913, who worked 255

days. There was a considerable increase in the quantity and percentage of coal mined by machines. In 1914 the machine-mined output increased from 4,124,301 tons, or 23.3 per cent, in 1913, to 4,937,222 tons, or 31.7 per cent. The number of machines in use, however, decreased from a total of 377 in 1913 to 362 in 1914. Of the latter, 223 were punchers, 88 short wall, 31 chain breast, and 20 long wall. The powder-mined coal in 1914 amounted to 5,498,988 tons, or 35.3 per cent, a marked decrease from the record of 1913, when more than 7,000,000 tons, or almost 40 per cent of the total, was shot off the solid. Hand-mined coal decreased from 6,315,787 tons, or 35.7 per cent. in 1913, to 5,134,787 tons, or 32.9 per cent, in 1914.

The total time lost by strikes in 1914 was 3,940 days, 320 men being idle for an average of 12 days.

About one-half of the coal mined in Alabama in 1914 was washed before being marketed or used in the manufacture of coke. The quantity of washed coal was 7,913,030 tons, yielding 7,081,868 tons of cleaned coal and 831,162 tons of waste.

The statistics of fatal accidents compiled by the Bureau of Mines show that 128 men were killed in the coal-mining operations of Alabama in 1914, all but one underground. Fifty-three of the fatalities were due to falls of roof, 37 to gas explosions and burning gas, 11 to shocks or burns caused by contact with electric wires, and 24 to haulage-way accidents. The death rate per thousand in 1914 was 5.3 against 5 in 1913, and the number of tons mined for each life lost was 121,823, against 142,569 in 1913.

The statistics of production of coal in Alabama in 1913 and 1914, with the distribution of the product for consumption, are shown in the following table:

Production of coal in Alabama in 1913 and 1914, by counties, in short tons.

1913.

County.	Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Made into coke at mines	Total quantity	Total value	Average value per ton	Average number of days active	Average number of employees
Bibb	1,802,243	9,214	99,569	.....	1,911,026	\$2,979,240	\$1.56	274	3,158
Blount	174,580	2,758	1,620	.....	178,958	236,448	1.32	203	354
Etowah	135,815	725	1,252	.....	137,792	171,600	1.25	256	209
Jefferson	7,149,844	83,353	412,891	1,382,746	9,028,834	11,790,737	1.31	266	11,643
St. Clair	861,579	2,909	25,891	.....	890,379	1,150,457	1.29	277	798
Shelby	457,313	4,469	35,787	.....	497,569	862,783	1.73	257	850
Tuscaloosa	699,690	13,891	68,836	134,888	917,305	1,172,227	1.28	271	1,183
Walker	3,671,708	42,809	101,760	150,986	3,967,263	4,481,373	1.13	223	6,031
Winston	24,841	60	50	.....	24,951	36,724	1.47	228	67
Other counties* ..	116,423	2,162	5,030	.....	123,615	200,059	1.62	233	259
Small mines .....	.....	830	.....	.....	830	2,076	2.50	.....	.....
Total	15,094,036	163,180	752,686	1,668,620	17,678,522	23,083,724	1.31	255	24,552

*Cullman, Jackson and Marion.

1914.

Bibb	1,565,660	9,180	100,006	.....	1,674,846	\$2,576,057	\$1.54	242	2,986
Blount	147,640	1,300	1,444	.....	150,384	188,235	1.25	163	348
Etowah	153,402	1,293	2,214	.....	156,909	222,239	1.42	241	279
Jefferson	6,515,079	46,527	292,071	1,082,468	7,936,145	10,486,552	1.32	236	11,343
St. Clair	726,132	1,816	24,640	.....	752,588	978,196	1.30	229	896
Shelby	467,456	3,916	27,542	.....	498,914	927,442	1.86	239	936
Tuscaloosa	428,387	13,355	59,562	357,595	858,899	1,177,473	1.37	226	1,491
Walker	3,037,567	51,284	112,704	248,630	3,450,185	4,124,363	1.20	199	5,416
Winston	31,035	525	58	.....	31,618	46,787	1.48	248	101
Other Counties* ..	73,496	1,704	5,841	.....	81,041	119,496	1.47	187	246
Small mines .....	.....	1,893	.....	.....	1,893	3,079	1.63	.....	.....
Total	13,145,854	132,793	626,082	1,688,693	15,593,422	20,849,919	1.34	226	24,042

*Cullman, Jackson, and Marion.

In the following table is presented a statement of the production of coal in Alabama, by counties, during the last five years, with increase and decrease in 1914 as compared with 1913:

Production of coal in Alabama, 1910-1914, by counties, in short tons.

County.	1910	1911	1912	1913	1914	Increase(+, or decrease (-), 1914.
Bibb	1,580,564	1,633,197	1,781,335	1,911,026	1,674,846	- 236,180
Blount	} *235,456	*210,070	*276,429	*300,092	*228,146	- 71,946
Cullman						
Etowah	172,465	255,860	171,308	137,792	156,909	+ 19,117
Jefferson	8,298,702	7,776,390	8,174,849	9,028,834	7,936,145	- 1,092,689
St. Clair	428,409	529,211	749,753	890,379	752,588	- 137,791
Shelby	488,141	463,089	496,949	497,569	498,914	+ 1,345
Tuscaloosa	1,081,219	1,031,658	880,967	917,305	858,899	- 58,406
Walker	3,788,479	3,103,595	3,547,962	3,967,263	3,450,185	- 517,078
Winston	16,442	16,424	18,730	24,951	31,618	+ 6,667
Other counties and small mines	21,585	1,927	2,318	3,311	5,172	+ 1,861
Total	16,111,462	15,021,421	16,100,600	17,678,522	15,593,422	- 2,085,100
Total value	\$20,236,853	\$19,079,949	\$20,829,252	\$23,083,724	\$20,849,919	-\$2,233,805

*Includes production of Marion County.

The statistics of production in Alabama from 1840 to the close of 1914 are shown in the following table:

Production of coal in Alabama from 1840 to 1914, in short tons.

Year	Quantity	Year	Quantity	Year	Quantity	Year	Quantity
1840.....	946	1860.....	10,200	1880.....	323,972	1900.....	8,394,275
1841.....	1,000	1861.....	10,000	1881.....	420,000	1901.....	9,099,052
1842.....	1,000	1862.....	12,500	1882.....	896,000	1902.....	10,354,570
1843.....	1,200	1863.....	15,000	1883.....	1,568,000	1903.....	11,654,324
1844.....	1,200	1864.....	15,000	1884.....	2,240,000	1904.....	11,262,046
1845.....	1,500	1865.....	12,000	1885.....	2,492,000	1905.....	11,866,069
1846.....	1,500	1866.....	12,000	1886.....	1,800,000	1906.....	13,107,963
1847.....	2,000	1867.....	10,000	1887.....	1,950,000	1907.....	14,250,454
1848.....	2,000	1868.....	10,000	1888.....	2,900,000	1908.....	11,604,593
1849.....	2,500	1869.....	10,000	1889.....	3,572,983	1909.....	13,703,450
1850.....	2,500	1870.....	11,000	1890.....	4,090,409	1910.....	16,111,462
1851.....	3,000	1871.....	15,000	1891.....	4,759,781	1911.....	15,021,421
1852.....	3,000	1872.....	16,800	1892.....	5,529,312	1912.....	16,100,600
1853.....	4,000	1873.....	44,800	1893.....	5,136,935	1913.....	17,678,522
1854.....	4,500	1874.....	50,400	1894.....	4,397,178	1914.....	15,593,422
1855.....	6,000	1875.....	67,200	1895.....	5,693,775	Total..	270,547,780
1856.....	6,800	1876.....	112,000	1896.....	5,748,697		
1857.....	8,000	1877.....	196,000	1897.....	5,893,770		
1858.....	8,500	1878.....	224,000	1898.....	6,535,283		
1859.....	9,000	1879.....	280,000	1899.....	7,593,416		

The following tables give other details concerning the coal production in Alabama, including rank of the first ten coal producing states; production by classes of mines; labor statistics; strikes and suspensions; machines used; methods of mining, etc.

Rank of first ten coal-producing States in 1913 and 1914, with quantity and value of products and percentage of each.

1913.

Production				Value			
Rank	State or Territory	Quantity (short tons)	Percentage of total product'n	Rank	State or Territory	Value	Percentage of total value
1	Pennsylvania :			1	Pennsylvania :		
	Anthracite	91,524,922	16.1		Anthracite	\$195,181,127	25.7
	Bituminous	173,781,217	30.5		Bituminous	193,039,806	25.4
2	West Virginia	71,254,136	12.5	2	West Virginia.....	71,872,165	9.5
3	Illinois	61,618,744	10.8	3	Illinois	70,313,605	9.2
4	Ohio	36,200,527	6.3	4	Ohio	39,948,058	5.3
5	Kentucky	19,616,600	3.4	5	Alabama	23,083,724	3.0
6	Alabama	17,678,522	3.1	6	Kentucky	20,516,749	2.7
7	Indiana	17,165,671	3.0	7	Indiana	19,001,881	2.5
8	Colorado	9,232,510	1.6	8	Colorado	14,035,090	1.8
9	Virginia	8,828,068	1.5	9	Iowa	13,496,710	1.8
10	Iowa	7,525,936	1.3	10	Kansas	12,036,292	1.6

1914.

1	Pennsylvania :			1	Pennsylvania :		
	Anthracite	90,821,507	17.7		Anthracite	\$188,181,399	27.6
	Bituminous	147,983,294	28.8		Bituminous	159,006,296	23.3
2	West Virginia	71,707,626	14.0	2	West Virginia	71,391,408	10.5
3	Illinois	57,589,197	11.2	3	Illinois	64,693,529	9.5
4	Kentucky	20,382,763	4.0	4	Ohio	21,250,642	3.1
5	Ohio	18,843,115	4.0	5	Kentucky	20,852,463	3.0
6	Indiana	16,641,132	3.2	6	Alabama	20,849,919	3.0
7	Alabama	15,593,422	3.0	7	Indiana	18,290,928	2.7
8	Colorado	8,170,559	1.6	8	Colorado	13,601,718	2.0
9	Virginia	7,959,535	1.5	9	Iowa	13,364,070	2.0
10	Iowa	7,451,022	1.4	10	Kansas	11,238,253	1.6

Production of coal in Alabama in 1913 and 1914, according to classes of mines, in short tons.

1913.

	Mines		Production		
	Number	Percentage	Total	Average	Per Mine
First Class :					
(Mines producing over 200,000 tons).....	19	8.5	6,112,051	321,687	34.6
Second Class :					
(Mines producing from 100,000 to 200,000 tons).....	42	18.7	5,862,478	139,583	33.2
Third Class :					
(Mines producing from 50,000 to 100,000 tons).....	44	19.6	3,121,545	70,944	17.6
Fourth Class :					
(Mines producing from 10,000 to 50,000 tons).....	94	42.0	2,448,122	26,044	13.8
Fifth Class :					
(Mines producing less than 10,000 tons).....	25	11.2	133,496	5,340	0.8
Total.....	224		17,677,692	78,918	

1914.

First Class :					
(Mines producing over 200,000 tons).....	15	7.2	4,995,244	333,016	32.1
Second Class :					
(Mines producing 100,000 to 200,000 tons).....	37	17.9	4,851,555	131,123	31.1
Third Class :					
(Mines producing 50,000 to 100,000 tons).....	49	23.7	3,617,972	73,836	23.2
Fourth Class :					
(Mines producing 10,000 to 50,000 tons).....	80	38.7	2,014,766	25,185	12.9
Fifth Class :					
(Mines producing less than 10,000 tons).....	26	12.5	111,992	4,307	.7
Total.....	207		15,591,529	75,321	

LABOR STATISTICS.

Statistics of labor employed in coal mines of Alabama 1908-1914.

Year	Number of days active	Average Number Employed
1908.....	222	19,197
1910.....	249	22,210
1911.....	227	22,707
1912.....	245	22,613
1913.....	255	24,552
1914.....	226	24,042

Average production per man compared with hours worked per day, and average number of days worked 1910-1914.

Year	8 hours		9 hours		10 hours		All others	Total	Days Worked	Average Tonnage	
	Mines	Men	Mines	Men	Mines	Men	Men	Men		Per Year	Per Day
1910.....	18	766	36	2,633	134	17,306	1,525	22,230	249	725	2.91
1911.....	15	550	50	5,345	102	12,628	4,184	22,707	227	662	2.92
1912.....	11	338	46	4,145	107	13,938	4,192	22,613	245	712	2.91
1913.....	13	420	36	2,496	135	18,185	3,451	24,552	255	720	2.82
1914.....	14	646	24	3,546	150	18,115	1,735	24,042	226	648	2.87

Statistics of labor strikes in the coal mines of Alabama in 1913 and 1914.

1913			1914		
Number of men on strike	Total days lost	Average number of days lost per man	Number of men on strike	Total days lost	Average number of days lost per man
1,048	27,041	26	320	3,940	12

MACHINES USED AND METHODS OF MINING.

Number and kind of machines in use in Alabama in 1913 and 1914.

Year	Pick	Chain Breast	Long Wall	Short Wall	Total
1913	249	42	20	66	377
1914	223	31	20	88	362

Bituminous coal mined by machines in Alabama in 1913 and 1914.

Year	Number of machines in use	Number of tons mined by machines	Total tonnage of Alabama	Percentage of total product mined by machines
1913	377	4,124,301	17,678,522	23.3
1914	362	4,937,222	15,593,422	31.66

Quantity and percentage of coal mined by different methods in Alabama in 1913 and 1914, short tons.

Year	Mined by hand	Percentage	Shot off the solid	Percentage	Mined by machines	Percentage	Not reported	Percentage	Total production
1913	6,315,787	35.7	7,052,234	39.9	4,124,301	23.3	186,200	1.1	17,678,522
1914	5,134,787	32.9	5,498,988	35.3	4,937,222	31.7	22,425	.14	15,593,422

COAL WASHING OPERATIONS.

Coal washed at the mines in Alabama in 1913 and 1914, with quantity of washed coal and of refuse obtained from it, short tons.

Year	Quantity of coal washed	Quantity of cleaned coal	Quantity of refuse
1913.....	8,149,082	7,210,588	938,494
1914.....	7,913,030	7,081,868	831,162

AVERAGE VALUE OF ALABAMA COAL.

Average value per short ton for coal at the mines in Alabama since 1908.

1908	1909	1910	1911	1912	1913	1914	Advance in 1914
\$1.26	\$1.19	\$1.26	\$1.27	\$1.29	\$1.31	\$1.34	\$0.03

COKE.

C. E. LESHER.

THE production of coke in Alabama decreased from 3,323,664 short tons, valued at \$9,627,170, in 1913 to 3,084,149 tons, valued at \$8,408,443, in 1914. The decrease was 239,515 tons, or 7 per cent, in quantity and \$1,218,727, or 12.7 per cent, in value. There were in Alabama 4 retort-oven establishments with a total of 750 ovens, and in 1914 these 4 establishments produced 2,031,535 tons, or nearly 66 per cent of the total output, whereas 16 active beehive plants with an aggregate of 2,562 ovens in blast produced 1,052,614 tons, or a little more than 34 per cent of the total. The average production per oven in the by-product plants was 2,700 tons and the average production from active beehive ovens was 411 tons. The increase in the production of by-product coke in 1914 over 1913 was 8,576 tons, or 0.4 per cent, and the decrease in the production of beehive coke was 248,091 tons, or 18.3 per cent. The value of the by-product coke, however, showed a decrease of \$147,117, or 2.8 per cent, a little over 10 per cent of the total decrease in the State. The average yield of coal in coke from the retort ovens was 69.8 per cent, and the average yield in the beehive ovens was 59.5 per cent. There is not the marked difference in the values of retort and beehive cokes (and in favor of the former) in Alabama as is shown in some States, for in Alabama the retort ovens, like the beehive, are located near the mines, and the two in that respect are somewhat on a parity, whereas in most of the States in which retort coke is made the

ovens are at considerable distances from the mines, and the transportation charges assessed against the coal appear in the cost of the coke to the consumer. In fact, the Alabama beehive coke had a higher value per ton in 1914 than the retort coke, the average being \$3.16 for beehive and \$2.50 for retort coke. The explanation of this seeming inconsistency lies in the fact that all of the retort coke is used by the producers in their own furnaces, and the coke is charged to the furnaces at little more than cost, whereas the greater part of the beehive product is commercial coke, some of it for foundry use, and profits are included in the value.

That the beehive oven has had its day in Alabama and is on the decline is evidenced by the fact that no new ovens of that type have been built in the last five years, and that 18 establishments with a complement of 5,015 ovens out of a total of 34 establishments with 8,535 ovens were idle in 1914, not counting the idle ovens at plants producing some coke in 1914. There were fewer beehive ovens in existence in Alabama in 1914 than in 1908, six years before. The number of retort ovens increased from 620 in 1912 and 700 in 1913 to 750 in 1914. The 750 completed ovens included 300 Semet-Solvay and 450 Koppers ovens. There were no new ovens under construction in Alabama at the close of 1914, and 8 establishments with a total of 1,047 beehive ovens were abandoned during the year.

The production of coke in Alabama in 1880, 1890, 1900, and annually from 1910 to 1914, is shown in the following table:

Statistics of the manufacture of coke in Alabama, 1880-1914.

Year	Establishments	Ovens		Coal used (short tons)	Yield of coal in coke (per cent)	Coke produced (short tons)	Total value of coke at ovens	Value of coke at ovens, per ton
		Built	Building					
1880.....	4	316	100	106,283	57.0	60,781	\$183,063	\$3.01
1890.....	20	4,805	371	1,809,964	59.0	1,072,942	2,589,447	2.41
1900.....	30	6,529	690	3,582,547	58.9	2,110,837	5,629,423	2.67
1910.....	43	10,132	340	5,272,322	61.6	3,249,027	9,165,821	2.82
1911.....	44	10,121	280	4,411,298	62.6	2,761,521	7,593,594	2.75
1912.....	46	10,208	100	4,585,498	64.9	2,975,489	8,098,412	2.72
1913.....	46	10,284	20	5,218,323	63.6	3,323,664	9,627,170	2.90
1914.....	38	*9,285	0	4,678,196	65.9	3,084,149	8,408,443	2.73

*Includes 300 Semet-Solvay and 450 Koppers ovens.

Almost 85 per cent of the coal used in the manufacture of coke in Alabama is washed before being charged into the ovens. In 1914, out of a total of 4,678,196 tons of coal made into coke, 3,974,955 were washed. Of the washed coal used 1,905,317 tons were slack and 2,069,638 were mine run. The unwashed mine-run coal used was 703,241 tons. No unwashed slack was used in 1914.

The character of the coal used in the manufacture of coke in Alabama in 1890, 1900, and for the last five years is shown in the following table:

Character of coal used in the manufacture of coke in Alabama, 1890-1914, in short tons.

Year	Run of Mine		Slack		Total
	Unwashed	Washed	Unwashed	Washed	
1890.....	1,480,669	0	206,106	123,189	1,809,964
1900.....	1,729,882	152,077	165,418	1,535,170	3,582,547
1910.....	771,931	1,308,085	0	3,192,306	5,272,322
1911.....	693,135	1,295,109	2,937	2,420,117	4,411,298
1912.....	747,305	896,421	18,793	2,922,979	4,585,498
1913.....	868,659	684,223	0	3,665,441	5,218,323
1914.....	703,241	2,069,638	0	1,905,317	4,678,196

RANK OF COKE-PRODUCING STATES.

The record of the production of coke in 1914 effected several changes in relative importance of the States in connection with the industry. Illinois superseded West Virginia as fourth in rank, but with that exception the first seven States held the same position in 1914 as in 1913. Pennsylvania of course stands preeminently first, with Alabama second, and Indiana third. West Virginia was fifth in 1914, but if all of the coke made from West Virginia coal were produced in that State it would be well fixed in second place, as by far the larger part of the coke manufactured in Ohio, Indiana, and Illinois is from West Virginia coal. As, however, the production of coke in retort ovens at or near the points of consumption is likely to continue to increase in greater proportion and the beehive ovens to disappear gradually from the mining

regions, it is not probable that West Virginia will again assume its former importance as a coke-producing State. The quantity of coke made in West Virginia in 1913 was less than one-half of that made from West Virginia coal in ovens outside the State.

Among the less important States Wisconsin moved up from ninth to eighth place, Michigan from eleventh to ninth, Ohio from fourteenth to eleventh, and Tennessee was replaced by Kentucky, which moved from sixteenth to thirteenth place. New York, eighth in rank in 1913, fell to twelfth in 1914. The positions held by the coke-producing States are shown in the following table:

Rank of the States in production of coke, 1910-1914.

State	1910	1911	1912	1913	1914	State	1910	1911	1912	1913	1914
Pennsylvania	1	1	1	1	1	Kentucky	20	19	18	16	13
Alabama	3	2	2	2	2	New Mexico	10	11	12	12	14
Indiana	17	6	3	3	3	Utah	16	17	15	15	15
Illinois	4	4	5	5	4	Tennessee	13	14	14	13	16
West Virginia	2	3	4	4	5	New Jersey	15	16	17	17	17
Virginia	5	7	7	6	6	Minnesota	18	18	19	19	18
Colorado	6	5	6	7	7	Maryland	12	13	16	18	19
Wisconsin	8	9	9	9	8	Washington	19	20	20	20	20
Michigan	11	12	11	11	9	Georgia	21	21	21	21	21
Massachusetts	9	10	10	10	10	Kansas	24	22	22	.....	.....
Ohio	14	15	13	14	11	Montana	22	.....	.....	.....	.....
New York	7	8	8	8	12	Oklahoma	23	.....	.....	.....	.....

Comparison of the production and value of coke in Alabama in 1913 and 1914.

	Number of ovens	Coal charged (short tons)	Coke produced (short tons)	Total value of coke at ovens	Percentage of total U. S. value
1913	10,284	5,218,323	3,323,664	\$9,627,170	7.46
1914	9,285	4,678,196	3,084,149	8,408,443	9.52
Decrease	999	540,127	239,515	1,218,727	.....
Percentage	9.71	10.36	7.2	12.66	.....

Quantity and value of coal used in the manufacture of coke in Alabama in 1913 and 1914, and quantity and value of same per ton of coke.

Year	Coal used (short tons)	Total value of coal	Value of coal per ton	Quantity of coal per ton of coke (short tons)	Value of coal to a ton of coke
1913.....	5,218,323	\$7,609,963	\$1.46	1.570	\$2.292
1914.....	4,678,196	6,765,639	1.45	1.517	2.239

Character of coal used in the manufacture of coke in Alabama in 1913 and 1914, in short tons.

Year	Run of Mine		Slack		Total			
	Unwashed	Washed	Unwashed	Washed	Unwashed	Percentage	Washed	Percentage
1913	868,659	684,223	0	3,665,441	868,659	16.6	4,349,664	83.4
1914	703,241	2,069,638	0	1,905,317	703,241	15.0	3,974,955	85.0

Statistics of the production of coke in beehive and retort ovens in Alabama, 1913 and 1914.

Year	Beehive Coke		By-product Coke		Total	
	Quantity	Value	Quantity	Value	Quantity	Value
1913.....	1,300,705	\$4,401,216	2,022,959	\$5,225,954	3,323,664	\$9,627,170
1914.....	1,052,614	3,329,606	2,031,535	5,078,837	3,084,149	8,408,443

Record of by-product ovens in Alabama, 1910-1914.

Year	Built	Building
December 31, 1910.....	280	340
December 31, 1911.....	340	280
December 31, 1912.....	620	100
December 31, 1913.....	700	20
December 31, 1914.....	750	0

Complete list of retort coke-oven plants of Alabama, Jan. 1, 1915.

Town	System	Name of company owning plant	Number of installments	Date put in operation	Number of ovens	Uses of coke	Uses of surplus gas
Ensley (near Birmingham)	Semet-Solvay	Tennessee Coal, Iron & R. R. Co.	First	October, 1898	120	Blast furnace	Fuel
Tuscaloosa	Semet-Solvay	Central Iron & Coal Co.	Second	March, 1902	120	Blast furnace	Fuel
Tuscaloosa	Semet-Solvay	Central Iron & Coal Co.	First	February, 1906	40	Blast furnace	Fuel
Woodward	Koppers	Woodward Iron Co.	Second	1914	20	Blast furnace	Fuel
Woodward	Koppers	Woodward Iron Co.	First	1911	60	Blast furnace	Fuel and power
Woodward	Koppers	Woodward Iron Co.	Second	1913	80	Blast furnace	Fuel and power
Fairfield	Koppers	Tennessee Coal, Iron & R. R. Co.	Third	1914	30	Blast furnace	Fuel and power
			First	1912	280	Blast furnace	Fuel and power

GOLD AND SILVER.

J. P. DUNLOP.

THERE does not appear to be any record of the first mining in Alabama, but it probably dates from about 1830 or shortly after the gold excitement commenced in Georgia. The estimated production up to 1879 was \$365,300, and the yearly output from 1880 to 1903 varied from \$1,000 to \$8,000 a year. Alabama, unlike most other Southern States, has made its greatest production in recent years from 1904 to 1910, from deep mines, including the Hog Mountain in Tallapoosa County and the Storey in Talladega County. The estimated total yield of gold from Alabama to the end of 1914 is \$749,384.

The mine production of gold in Alabama in 1914 was \$11,970, against \$11,094 in 1913, and the by-product of silver was 199 fine ounces against 117 ounces in 1913. The total value of the production of precious metals was \$12,080, against \$11,165 in 1913. No copper, lead, or zinc production has been reported from Alabama in recent years.

The following table shows the mine production of gold, silver, and copper in Alabama since 1905, when the United States Geological Survey first collected detailed figures from the mines of the Eastern States:

Tonnage of ore treated and output of metals in Alabama, 1905-1914.

Year	Ore sold or treated Short tons	Gold*	Silver* Fine ounces	Copper Pounds	Total value
1905	16,425	\$41,530	336	.....	\$41,733
1906	8,565	24,921	124	.....	25,004
1907	18,400	25,982	439	84,678	43,208
1908	11,174	41,208	282	.....	41,357
1909	9,886	29,239	212	.....	29,349
1910	9,763	33,533	268	.....	33,678
1911	6,360	18,916	171	.....	19,007
1912	5,693	16,724	168	.....	16,827
1913	4,068	11,094	117	.....	11,165
1914	5,079	11,970	199	.....	12,080
Increase in 1914	1,011	876	82	.....	915
Percentage	24.85	7.89	70.08	.....	81.97

*Includes placer gold and silver.

The production for 1914 was mainly from 5,079 short tons of siliceous ore, with an average recoverable value in gold and silver of \$2.28 a ton, against 4,068 tons and an average recovery of \$2.74 in 1913, and 5,693 tons and an average recovery of \$2.96 in 1912. The only placer gold reported was a small quantity obtained by the Clear Creek Gold Mining Co., from the Arbacoochee placers, in Cleburne County. These placers were worked experimentally by means of a small dredge from May until December, when the plant was dismantled.

In Clay County, near Pyriton, are several pyrite mines, all idle in 1913 and 1914, whose ores, formerly sold for their sulphur content, produced residues containing gold, silver and copper. It is reported that the property of the Southern Mineral Development Co. at Pyriton, contains a large deposit of crystalline granular pyrite capable of producing first-class ore for acid manufacture, but that its development awaits a market for the ore. One assay in 1914 is reported to show a content of 5.20 per cent of copper and of \$1.60 in gold per ton of the ore.

At the Storey mine, near Waldo, in Talladega County, now owned by the Gold Log Mining Co., a considerable quantity of ore was treated in a 10-ton-5-stamp mill, by amalgamation. The ore is siliceous and occurs in veins and lenses in the metamorphic schists. The mine and the mill were operated intermittently during the year, and considerable development was accomplished.

At the Hog Mountain mine, near Alexander City, in Tallapoosa County, an increased tonnage was treated in a 100-ton cyanidation and blanket-concentration plant, after crushing in rolls and tube mill. Concentrates made contained about 6.2 per cent of bismuth, but this was not paid for by the purchasers. The greater part of the ore treated was unoxidized, but a portion was from the oxidized zone, which extends from 40 to 60 feet from the surface. The veins are of quartz in intrusive granite, and a little pyrrhotite is reported present. The quantity of gold recovered by means of cyanidation was slightly in excess of that derived from concentrates, and most of the small yield of silver was derived from the concentrates shipped.

The old mine of the Dutch Bend Mining Co., also near Alexander City, which is equipped with a 20-stamp mill, was still idle because of litigation.

GRAPHITE.

EDSON S. BASTIN.

THREE firms produced graphite in Alabama in 1914. They were the Quenelda Graphite Company, and the Alabama Graphite Company in Clay County, and the Flaketown Graphite Company in Chilton County.

The last firm installed early in the year a Huff electrostatic separator for the final refining of the flake graphite, with a view especially to the elimination of admixed mica.

According to H. B. Johnson, who installed the electrostatic equipment, the product obtained ran over 94 per cent carbon in carload lots. As this process avoids the use of buhrstone mills, practically no graphite dust is produced, all the product being coarser than 60 mesh. The "dust" brings comparatively small prices, hence the economy effected in this particular is important.

About December 1 a new company, the Jennings Graphite Company, with office at Lineville in Clay County, began the mining of graphite about three miles north of Ashland.

Production and value of crystalline graphite in 1913 and 1914.

	Quantity Pounds	Value	Percentage of total U. S. Quantity	Percentage of total U. S. Value
1913	2,020,910	\$87,336	29.73	29.73
1914	2,410,200	118,000	27.79	*36.41
Increase	389,290	31,336		
Percentage	19.26	35.88		

*This is Alabama's proportion of the total U. S. value of graphite (amorphous and crystalline), while Alabama's production in 1914 represents 41.35 per cent of the total U. S. value of crystalline graphite.

For extended notes on the Alabama graphite occurrences, those interested are referred to the section on Graphite by Mr. E. S. Bastin, in Bulletin No. 15 of the Geological Survey of Alabama.—E. A. S.

IRON ORE.

EUGENE A. SMITH.

IRON ores of Alabama in the order of their economic importance are (1) red ore or hematite; (2) the brown ore or limonite; (3) the gray ore. The black band and clay iron stone have been noticed as occurring in a number of places, but only the red ore and the brown ore have been mined on any large scale.

Practically all the ore mined in Alabama is smelted in the State, the shipments out of the State being about equal to those received from other states.

The tables given below will show the rank of Alabama among the States of the Union both in the production of iron ore and in pig iron.

RED ORE OR HEMATITE.

All the ore of this quality mined in Alabama occurs in the Clinton or Red Mountain formation. The Red Mountain ridges occur on each side of the anticlinal valleys which separate the coal fields. In places the red ore ridges are lacking on one side, usually the western, of the valleys, being cut out by faults, while on the other hand the ridge may be duplicated on one side of the valley by the same faults.

In most of the valley occurrences the moderate dips of the ore bed are on the eastern side and there are also practically all of the ore mines. Murphrees Valley makes an exception to this, the moderate dips and the iron mines being on the western side. The iron ore occurs mainly in the central part of the formation in seams or beds one to five in number, which vary in thickness from a few inches to thirty feet.

While the ore seams are very persistent along the outcrop which in Alabama must be as much as 50 miles, yet they vary greatly from place to place, being either too thin or too lean for profitable working in the greater part of this distance.

The most important development of the Clinton ore in this State and in the world is along the 15 or 16 miles stretch of the east Red Mountain between Birmingham and Bessemer, and there is a practically continuous series of mines and strip-pings for this entire distance. Much mining of this ore has also been done near Gate City, Village Springs, Attalla, Gadsden, Round Mountain, Gaylesville, Ft. Payne, Valley Head, etc.

The completion in October, 1912, of a diamond drill boring in Shades Valley, within a mile of the base of Shades Mountain, gives a definite answer to the speculations concerning the occurrence of red ore under Shades Valley. This boring shows that there is no falling off in the thickness and quality of the ore with distance from the outcrop, and that the depth of the ore below the surface at a distance of more than $2\frac{1}{2}$ miles from the outcrop on Red Mountain is not too great for shaft mining.

The elevation of the surface at the drilling is 595 feet. The top of the ore was reached at a depth of 1,902 feet and a section of the seam in descending order is:

Ore (self-fluxing)	9 ft. 6 in.
Shale	4 in.
Ore (Siliceous)	9 ft. 6 in.

An analysis of an average sample of the drill core of the upper bench, made by David Hancock, shows as follows:

	Per Cent.
Metallic iron	39.51
Silica	9.94
Alumina	3.34
Calcium Carbonate	24.20
Magnesium carbonate	.78
Metallic manganese	.20
Phosphorus	.32

The importance of this demonstration of a vast increase in the amount of red ore available immediately or in the near future, cannot well be overestimated.

In 1913 the Gulf States Steel Company acquired about 1,500 acres of land upon which the drill hole above mentioned was located. They have since been sinking a double track slope to the ore, which they expect to reach about April 1, 1916. In time this is likely to be the largest producing mine in the State.

Another drill hole was put down in Shades Valley in 1913, in Section 19, T. 19, R. 3 W., but the records are not available for publication at the present time.

The hematite production of Alabama for 1914 was 3,902,567 long tons as against 4,370,823 tons, a decrease for 1914 of 468,256 tons or 10.71 per cent.

This 1914 production of hematite is 80.65 per cent of the total iron ore production of the State, and 9.42 per cent of the total iron ore production of the United States.

The average price of hematite in Alabama in 1913 was \$1.18; in 1914, \$1.21.

BROWN ORE OR LIMONITE.

This ore, the second in importance in the State and third in the United States, furnished only 2.26 per cent of the total iron ore production of the United States, and 19.35 per cent of the iron ore production of the State in 1914. The entire limonite production of the United States in 1914 was 1,537,750 long tons, of which Alabama contributed 936,392 tons or 60.89 per cent, and the State holds accordingly the first rank in this industry.

In the early days of iron making and up to the year 1876 this was the only ore used in the catalan forges, bloomaries, and charcoal furnaces of the State. It was then demonstrated that good iron could be made at low cost from the red ores, with coke for the fuel.

In general the limonites are considered the best of the ores of Alabama and they command the highest prices and command a ready sale.

The usual mode of occurrence is in irregular masses of concretionary origin in the residual clays resulting from the decomposition of limestones, and as a consequence the mining is uncertain and expensive. Limonite also occurs in regularly

stratified seams or beds, and then it is the result of the alteration of pyrites or of carbonate ores. Practically all of the brown ore actually mined is that occurring in the residual clays above mentioned. Most of the ore before going to the furnace is washed and screened, and this manipulation, together with the cost of mining, makes it the most expensive of the iron ores, and it is therefore seldom used alone, but is usually mixed with the red ore in proportions determined by the quality of the iron desired. It is used alone in the charcoal furnaces and also in the coke furnaces when a particularly tough pig iron is wanted.

The limonite deposits are very numerous and are distributed over a broad expanse of country and in many places are known to be very extensive. In some of the deposits the ore is in nearly solid mass, in others it is much scattered, and in consequence the amount of foreign material necessary to be moved for every ton of ore produced, varies very much, not only in the different ore banks but also in the different parts of the same bank.

The deposits occur in nearly all the geological formations of the State, but in most of these the ore is either insufficient in quantity or not pure enough to be of much commercial value. The most important of the deposits, in point of extent and value, occur overlying the following formations, viz., the Knox Dolomite and the Weisner Quartzite, the Lauderdale Chert of the Lower Carboniferous, and the Lafayette. Some extensive beds of ore of inferior quality generally occur also in the Tuscaloosa formation of the Cretaceous, and in the upper part of the Lower Carboniferous and in the Metamorphic rocks.

The limonite or brown ore production of Alabama in 1914 was 936,392 long tons, as against 844,917 tons in 1913, an increase of 91,475 tons or 10.83 per cent.

The average price per long ton of brown ore marketed in Alabama in 1913 was \$1.61; in 1914, \$1.49.

The following tables show details concerning the production of iron ore in the State, together with the rank of the State in mined and marketed iron ore in 1913 and 1914.

Iron ore mined in Alabama in 1913 and 1914, by varieties, with percentage of increase in 1914, in long tons.

Year	Hematite	Brown Ore	Total Quantity	Percentage of total U. S. produc'n.
1913	4,370,823	844,917	5,215,740	8.42
1914	3,902,567	936,392	4,838,959	11.68
Decrease or Increase.....	- 468,256	+ 91,475	- 376,581	.....
Percentage of Decrease or Increase in 1914.....	- 10.71	+ 10.83	- 7.22	.....

Iron ore marketed in Alabama in 1913 and 1914, by varieties, in long tons.

Year	Hematite	Brown Ore	Total Quantity	Total Value
1913	4,488,176	845,042	5,333,218	\$6,648,569
1914	3,589,809	925,117	4,514,926	5,727,619
Increase or Decrease.....	- 898,367	+ 80,075	- 818,292	- 920,950
Percent. of Incr'se or Decrease	20.02	9.49	15.34	13.85

Rank of first five states in mined and marketed production of iron ore in 1913 and 1914.

1913.

Rank	State	Mined		Marketed			
		Quantity (long tons)	Percentage of total production	Quantity (long tons)	Percentage of total production	Value	Percentage of total value
1	Minnesota	38,657,793	62.37	36,603,331	61.37	\$80,789,025	61.72
2	Michigan	12,841,093	20.72	12,668,560	21.24	33,479,954	25.58
3	Alabama	5,215,740	8.42	5,333,218	8.94	6,648,569	5.08
4	New York.....	1,459,628	2.36	1,420,889	2.38	3,100,235	2.37
5	Wisconsin	1,018,272	1.64	896,243	1.50	2,149,397	1.64

1914.

1	Minnesota	21,946,901	52.96	23,298,547	58.66	\$40,628,771	56.50
2	Michigan	10,796,200	26.05	8,533,280	21.49	18,722,358	26.04
3	Alabama	4,838,959	11.68	4,514,926	11.37	5,727,619	7.97
4	Wisconsin	886,512	2.13	591,595	1.49	1,178,610	1.64
5	New York	785,377	1.90	640,252	1.61	1,992,892	2.77

PRINCIPAL IRON ORE MINES.

IN 1914 there were 340 iron ore mines active in the United States as compared with 411 in 1913, and 164 mines produced more than 50,000 long tons of iron ore each, as compared with 194 mines in 1913.

The Red Mountain group of red hematite mines in the Birmingham District, Alabama, led in 1914 with an output of 2,008,465 long tons of ore, although this quantity is nearly 200,000 tons lower than the output of this group in 1913. Four of the five mines producing more than 1,000,000 tons each in 1914 are in Minnesota.

Iron ore mines of Alabama that produced more than 50,000 long tons each in 1914.

Name of Mine	Nearest Town	Variety of Ore	Quantity
1. Red Mountain Group.....	Bessemer.....	Hematite	2,008,465
2. Woodward, 1, 2, and 3.....	Lipscomb.....	Hematite	650,507
3. Raimund No. 1.....	Bessemer.....	Hematite	231,363
4. Songo.....	Songo.....	Hematite	150,732
5. Steinman.....	Steinman.....	Hematite	144,195
6. Greeley.....	Greeley.....	Brown Ore.....	136,289
7. Friedman.....	Woodstock.....	Brown Ore.....	81,556
8. Raimund No. 2.....	Bessemer.....	Hematite	77,823
9. Ironaton.....	Ironaton.....	Brown Ore.....	75,245
10. Houston.....	Rickey.....	Brown Ore.....	70,720
11. Doeray.....	Doeray.....	Brown Ore.....	67,237
12. Attalla.....	Attalla.....	Hematite	60,153
13. Tannehill.....	Goethite.....	Brown Ore.....	56,729
Total 13 mines.....			3,811,014
Unspecified* (4 mines).....			861,754
Tonnage from 17 mines producing over 50,000 tons.....			4,672,768
Tonnage from 14 mines producing less than 50,000 tons each.....			166,191
Grand total of Alabama production.....			4,838,959

*Includes the product of 4 mines, producing over 50,000 tons each, operated by 2 companies which do not permit the publication of individual statistics.

FIG IRON.

Quantity and value of pig iron (exclusive of ferro-alloys) marketed in the United States in 1913 and 1914 (first five states), with decrease and percentage of decrease in 1914, in long tons.

State	1913		1914		Decrease in 1914		Percentage of Decrease in 1914	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1 Pennsylvania	12,871,349	\$197,726,314	9,267,197	\$127,686,331	3,604,152	\$70,039,983	28.00	35.42
2 Ohio	6,913,961	103,824,517	5,226,925	70,331,114	1,687,036	33,493,403	24.40	32.26
3 Illinois	2,892,263	45,796,966	1,793,714	24,382,458	1,098,549	21,414,508	37.98	46.76
4 Alabama	1,924,762	23,242,374	1,661,420	17,481,828	263,342	5,760,546	13.68	24.78
5 New York	1,967,449	30,203,673	1,357,575	19,353,309	609,874	10,850,363	31.00	35.92

*Production of pig iron, (including ferro-alloys) in 1913 and 1914,
(first five States), in long tons
Bureau of Statistics of American Iron & Steel Institute.*

State	Rank	1913		1914	
		Quantity	Percentage	Quantity	Percentage
Pennsylvania	1	12,954,936	41.84	9,733,369	41.72
Ohio	2	7,129,525	23.02	5,283,426	22.64
Illinois	3	2,927,832	9.45	1,847,451	7.92
Alabama	4	2,057,911	6.65	1,826,929	7.83
New York and New Jersey	5	2,187,620	7.06	1,559,864	6.69

LIME.

EUGENE A. SMITH.

DURING the year 1914 there was a falling off in the production of lime in Alabama, as compared with the production of the preceding year. The total product of 12 operators in 1914, was 46,966 short tons, a decrease from the 1913 production of 28,502 short tons, or 37.77 per cent. The value of the product was \$199,814, a decrease of \$90,580, or 31.19 per cent.

As heretofore, the most important use of the lime produced was for building purposes. 22.57 per cent of the State's total production is definitely so credited in the returns, which, added to the 16.61 per cent in the form of hydrated lime, produced by three operators, gives 39.18 per cent definitely assigned to building purposes. Of the 66.29 per cent sold to dealers, uses not specified, a large proportion undoubtedly goes for building purposes, so that probably more than 50 per cent, possibly 75 per cent of the product is thus used. Other chief uses for lime are in chemical works, paper mills, soap factories, manufactories of sand-lime brick, slag cement, etc.

Shelby county as heretofore, was the largest producer in 1914, having produced 28,268 tons, or about 60 per cent of the total. The other producers in the order of their rank were Etowah, Blount, Jackson and DeKalb.

The following tables present some additional data on the lime production in Alabama in 1913 and 1914:

Production of lime, 1913 and 1914.

	Number of operators	Quantity (short tons)	Rank of state by quantity	Value	Rank of state by value	Average price per ton	Percentage of total U. S. value
1913	12	75,468	16	\$290,394	16	\$3.85	1.98
1914	12	46,966	17	199,814	18	4.25	1.51
Decrease		28,502		90,580			
Percentage		37.77		31.19			

Number of lime kilns in Alabama using various kinds of fuel in 1913 and 1914.

Year	Coal	Wood	Coal and Wood	Total Number of Kilns
1913.....	18	0	30	48
1914.....	*16	10	9	35

*8 coal and 8 gas producers.

Those interested in the subject of lime are referred to an article on lime by Ralph W. Stone of the U. S. Geological Survey, and on the Source, Manufacture, and Use of Lime, by E. F. Burchard and Warren E. Emley of the U. S. Geological Survey, published in Vol. II of the Mineral Resources of the United States for the year 1913.

MICA.

MICA mines were opened in Alabama during the early days of mica mining in the Southern States. Prospects have been tested at various subsequent times, and considerable mining has been carried on at intervals during the last 20 years. The mines are located in Randolph, Cleburne, Clay, and Tallapoosa counties, and there are prospects in Lee, Coosa, Chilton and other counties.

The mines of Randolph and Clay counties yield a very fine grade of clear "rum"-colored mica.

MINERAL WATERS.

R. B. DOLE.

RETURNS from Alabama indicate that the mineral-water trade in 1914 was much the same as in 1913. The sales amounted to 169,279 gallons, or 408 gallons less than in 1913, and the value of the output was \$17,125, or \$2,218 less than in 1913. The average price was 10 cents a gallon, against an average of 11 cents in 1913. The decrease in value was principally in table waters. Fourteen springs reported sales; four springs from which no reports were obtained have been considered idle. One spring idle in 1913 was active in 1914, and one spring's output which was not reported was estimated on the basis of sales in 1913. McCary Mineral Well and Talladega Springs reported sales for the first time. Six bathing establishments and 7 resorts accommodating about 1,200 guests were maintained. In addition to the quantity reported as sold, about 86,000 gallons of mineral water was used in the manufacture of soft drinks.

The following 14 springs reported sales:

Bailey Springs, Florence, Lauderdale County.
 Bladon Springs, Bladon Springs, Choctaw County.
 Bromberg Gulf Coast Lithia Spring, Bayou Labatre, Mobile County.
 Cooks Spring, Cooks Spring, St. Clair County.
 Dixie Spring, Dixie Spring, Walker County.
 Ingram Lithia Well, near Ohatchee, Calhoun County.
 Livingston Mineral Well, Livingston, Sumter County.
 Luverne Mineral Spring, Luverne, Crenshaw County.
 McCary Mineral Well, near Birmingham, Jefferson County.
 Matchless Mineral Wells, east of Greenville, Butler County.
 Purity Spring, Spring Hill, Mobile County.
 Shocco Spring, Talladega, Talladega County.
 Talladega Springs, Talladega, Talladega County.
 White Sulphur Wells, near Jackson, Clarke County.

The reports of the Alabama Mineral Springs, and The McGregor Spring, were received too late for inclusion in the 1914 tabulations. Estimate on the basis of the 1913 report has been made for the McGregor Spring.

The following table shows the relative productions and their respective values of mineral and table waters, in 1913 and 1914:

Production and value of mineral and table waters sold in 1913 and 1914.

	No. of springs reporting	Quantity sold (gallons)	Average retail price	Total value of mineral waters	Percentage of total U. S. value
1913	15	169,687	0.11	\$19,343	0.34
1914	15	169,279	.10	17,125	0.35
Decrease	—	408	—	2,218	.....
Percentage	—	.24	—	11.47	.....

The quantity of water used in the manufacture of "soft drinks" in 1913 was 70,000 gallons; in 1914, 86,500 gallons.

NATURAL GAS.

JOHN D. NORTHROP.

THE commercial production of natural gas in Alabama is limited to Madison, Walker, and Fayette counties, in the northern part of the State, the gas produced being supplied to some 395 domestic and 2 industrial consumers in West Huntsville, Jasper, and Fayette. Compared with 1913, the number of consumers supplied with gas in 1914 was increased by 57, and the income derived from the sale of gas was proportionately increased.

In Winston County, also, in the northern part of the State, a small quantity of natural gas produced from a single well was utilized in the field for drilling.

The small gas field in Fayette County is located in the western part of the Warrior coal field and obtains its production from sandstone layers in the lower part of the Pennsylvanian series of the Carboniferous system.

Two productive gas wells were completed in Alabama in 1914 and 4 exhausted wells were abandoned, there being 16 active gas wells in the State at the end of the year.

Because of the small number of producers, the statistics of production and consumption of natural gas in Alabama cannot be given, without revealing confidential data furnished by individual companies.

OCHER.

JAMES M. HILL.

OCHER is a hydrated ferric oxide permeating a clay base. It has a specific gravity of about 3.5 and a decidedly golden-yellow color. As viewed under the microscope and with considerable enlargement the particles composing ocher appear flocculent and uniform. Good grades should contain 20 per cent or more of iron oxide, though there is a wide variation in the iron content of the material sold as ocher. Ferruginous shale is often ground and the product marketed as ocher, but unless the material is actually an ocher, as defined above, such product is classed under slate and shale in this chapter.

In 1913 ocher was produced in Georgia, Pennsylvania, Virginia, Alabama, California, Iowa, and Vermont, the States being named in the order of their producing importance. In 1913 Alabama re-entered the class of ocher producers, a new mine being opened in Clarke County.*

Since the beginning of the European war domestic ochers have been more used than heretofore. It is the general opinion among the users of this pigment that the domestic ocher does not compare with the French ocher in tone, color, or strength. It seems to be the case, as in many American industries, that the producers will not prepare their materials with the care used by the foreign manufacturers. It is the belief of the writer that some domestic ochers could be made equal to the French ochers in every respect if American producers would give more attention to the details of cleaning and floating. It has been said of Americans ochers† that, "by skillful handling, a thoroughly satisfactory color can be obtained. This is done by tinting the ocher with American chrome yellow until the correct shade is obtained."

*This mine was the only producer of ocher in 1914, but there are many promising deposits of ocher in Alabama, especially in the area of the Tuscaloosa formation of the Cretaceous, as well as in other parts of the Coastal Plain southward nearly to the Gulf.—E. A. S.

†Paint, Oil, and Drug Rev., vol. 58, p. 4, Sept. 16, 1914.

SAND AND GRAVEL.

THE total production of sand and gravel in the State in 1914 was 831,430 short tons valued at \$262,219, as compared with 1,405,068 tons valued at \$398,088 in 1913, a decrease in quantity of 573,638 tons or 40.82 per cent, and in value of \$135,869 or 34.13 per cent.

There was a decrease in the quantity of sand of 73,258 short tons or 19.44 per cent, and in value of \$2,957 or 2.34 per cent.

In the quantity of gravel there was a decrease of 48.66 per cent, and in the value of 48.94 per cent.

Over 50 per cent of the sand was used for building purposes.

The following tables give a comparison of the production of sand and gravel in 1913 and 1914, and the production, value and disposition of the sand in these two years.

Production in short tons of sand and gravel in 1913 and 1914.

	Sand		Gravel		Total*		Percentage of total U. S. value
	Quantity	Value	Quantity	Value	Quantity	Value	
1913	376,797	\$126,483	1,028,271	\$271,605	1,405,068	\$398,088	1.64
1914	303,539	123,526	527,891	138,693	831,430	262,219	1.10
Decrease	73,258	2,957	500,380	132,912	573,638	135,869	.....
Percentage	19.44	2.34	48.66	48.94	40.82	34.13	.....

*Chert has been added to these totals.

Production (in short tons), value and kinds of sand in 1913 and 1914.

	Molding Sand		Building Sand		Grinding and Polishing Sand		Fire Sand		Paving Sand		Engine Sand		Other Sand		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1913	57,798	\$23,368	288,346	\$90,347	25,903	\$11,118	.....	.....	2,750	\$1,250	.....	.....	2,000	\$400	376,797	\$126,483
1914	92,551	43,702	152,800	51,792	8,062	4,104	22,135	\$6,450	5,849	\$4,538	12,040	\$3,127	10,112	\$9,813	303,539	\$123,526
Increase or Decrease	+ 34,753	+ 20,334	- 135,546	- 38,555	- 17,851	- 7,014	.....	.....	+ 3,099	+ 3,288	.....	.....	+ 8,112	+ 9,413	- 73,258	- 2,957
Percentage	60.13	87.02	47.01	42.67	68.91	36.91	.....	.....	112.69	263.04	.....	.....	405.60	2353.25	19.44	2.34

STONE.

EUGENE A. SMITH.

ON ACCOUNT of the variety of uses to which stone is put, there is no regular unit of measurement, and the figures in this report represent the values of the different varieties.

PRODUCTION.

Alabama produces only three kinds of stone, viz., limestone, marble, and sandstone.

The total value of the production of stone in Alabama showed an increase in 1914 of 2.63 per cent. The greater part of this increase was in the Limestone (rough building stone, crushed stone for road making, and concrete,) and for agricultural purposes. The sandstone also showed some increase. There was also a notable increase in the value of the marble produced. Exact figures for marble, however, cannot be given except for the year 1914, since before 1914 there were less than three producers.

The following table gives some additional details concerning the total stone production:

Total value of stone (limestone, sandstone and marble) produced in Alabama in 1914. Percentage of total U. S. value, rank of State and number of plants.

Year	Total value	Percentage of total U. S. value	Number of plants	Rank of State
1913	\$1,285,944	1.54	35	20
1914	1,319,753	1.71	38	22
Increase 1914	33,809			
Percentage	2.63			

LIMESTONE.

The most important use of the limestone produced in Alabama in 1914 as in 1913 was for furnace flux, while crushed stone for road-making and concrete follow next in importance. A very decided increase in the amount of ground limestone for agricultural purposes, is to be noted.

The limestone burned into lime or used in the manufacture of Portland cement is not taken into account here, but is included in the value of each of the finished products in whose manufacture it was used.

As thus limited the total value of the limestone produced in 1914 was \$787,214, as compared with \$812,664 in 1913, a decrease of \$25,450 or 3.13 per cent.

The value of the limestone produced in 1913 and 1914 classified according to the uses of the stone, are given in the following table:

Value of limestone (not including marble) produced in 1913 and 1914, according to uses.

Use	1913	1914	Increase (+) or Decrease (-)	Percentage
Rough Building	\$9,517	\$20,992	+ \$11,475	+ 119.5
Dressed Building	27,020	20,558	- 6,462	- 23.9
Paving	189			
Rubble	188			
Riprap	58,850	3,882	- 54,968	- 93.4
Crushed Stone:				
Road making	47,237	75,528	+ 28,291	+ 59.9
R. R. ballast.....	7,187	1,076	- 6,111	- 85.0
Concrete	168,195	287,119	+ 118,924	+ 70.7
Flux	487,078	360,691	- 126,387	- 25.9
Agricultural	7,203	17,365	+ 10,165	+ 141.1
Total.....	812,664	787,214	- 25,450	- 3.13

LIMESTONE FOR BUILDING PURPOSES.

The preparation of cut stone for building purposes in Alabama, while on the increase, is not yet what it should be.

Practically all of this material comes from the quarries in the subcarboniferous limestone of the Tennessee Valley, the most important quarries being at Rockwood in Franklin County, operated by Foster-Creighton-Gould Co., of Nashville. This stone is quite similar in appearance, composition, and other qualities to the Indiana stone, and so far as experience in the use of the stone from the two localities in the buildings of the University of Alabama goes, the Alabama stone holds its own under influence of the weather better than does the Indiana stone. Stone steps, door sills, and window sills, buttress caps, etc., of the Alabama stone put in place in 1885 show practically no deterioration in color and wear under foot, and in crumbling and roughening under the influence of the weather, which cannot be said of some portions of the Indiana stone used in buildings erected in 1909-10. The Rockwood quarries have most modern and approved methods of machinery for sawing the stone and handling it in transit to the mills and elsewhere. The stone is of massive formation, of great thickness and extent. Blocks weighing as much as 25 tons, without crack or flaw, are not infrequently quarried, the size of the blocks being practically limited only by the capacity of the hoisting machinery.

The Oolitic variety is most extensively used for building and monumental work. It is of light gray color, uniform grain, and homogeneous texture. It possesses a quality of cheapness, it can be cut to any design required, and is at the same time strong and durable.

With the installing of adequate machinery at the quarry for doing the finished work, there should never be any longer any reason for going outside of the State for this quality of stone. Already the material has been very extensively used in public buildings in Mississippi, Tennessee, as well as in Alabama. The only reason why it was not used in the recently erected buildings at the University of Alabama was that at the time these building contracts were let, the quarries furnished only the rough sawn stone and there was not in Alabama any establishment adequately equipped for the dressing of the stone in the quantity needed.

The above statements are confirmed by a report on the comparative tests made on the Rockwood stone, and those from

Bedford, Ind., and Bowling Green, Ky., by Prof. Robert H. McNeilly, in the Engineering Laboratory of Vanderbilt University.

From this report I give the following extracts:

"GENERAL CHARACTERISTICS.—The Rockwood limestone is an almost pure oolitic limestone with frequent small crystals of calcite distributed throughout its mass. It resembles closely the Bedford stone in appearance, except that it has a slightly more open texture. The Bowling Green stone is finer in grain, softer and more easily pulverized than either the Bedford or Rockwood stones, and contains an appreciable amount of petroleum, which lends somewhat to the ease with which it is worked. In all three stones the texture is exceptionally uniform, as it is almost impossible to detect the bedding planes by eye; however in this respect the Bowling Green stone is most marked, and it is frequently necessary to test by hammer to detect which is the bed plane. Rockwood stone is lighter in color than either the Bedford or Bowling Green stones.

"CHEMICAL ANALYSIS.—The following is an analysis of the Rockwood stone made at my request by Dr. Paul C. Bowers, Chief Chemist of the Tennessee Geological Department:

	Rockwood Stone.
Moisture and loss on heating to 175° C.-----	0.07
Insoluble siliceous residue (SiO ₂ , etc.)-----	0.49
Oxide of Iron and Alumina (Fe ₂ O ₃ & Al ₂ O ₃)-----	0.30
Carbonate of Lime (CaCO ₃)-----	98.23
Carbonate of Magnesia (MgCO ₃)-----	0.97
Total-----	100.06

"PHYSICAL TESTS.—Comparative physical tests of the three samples of stone were made as follows:

Loss in weight on drying,
 Cross bending tests,
 Compression tests,
 Absorption tests,
 Per cent of water absorbed.
 Specific gravity in bulk, and of pulverized stone,
 Density,
 Abrasion tests.

The results of these physical tests are summarized in the CONCLUSIONS below quoted.

"CONCLUSIONS.—The above tests were made as nearly as possible, under identical conditions, and barring the accidental characteristics of the samples, which were selected at random, these results are believed to represent truly the comparative characteristics of each of the stones under consideration.

"The Rockwood Stone shows itself to be a superior building stone to the others in every respect except density—but even here, since its absorption of water is the lowest of the three, it should prove more durable, while the smaller weight per cubic foot can be placed more cheaply on account of freight charges.

"As compared with the Bowling Green stone, the Rockwood shows a decidedly higher strength, and characteristics which indicate a greater durability. The Bowling Green stone, however, is undoubtedly more easily worked than either of the other two stones, due to its being softer and also to the presence of oil. This oil has the bad effect of staining the stone itself and the contiguous masonry for several years after it is placed, while the very ease with which the stone can be worked makes the Bowling Green very inferior where used for door sills and steps. This is shown well by the Abrasion Test which shows the Rockwood stone in its best light, as a very superior material for steps, door sills, and other places subject to wear.

"From my examination of these three stones, I believe no builder would make a mistake in using any one of the three, for they are all unquestionably very superior building stones. While each stone may have advantages over the other for some specially desired characteristics, as a building stone for general purposes, each is highly satisfactory.

Respectfully submitted,

ROBERT H. MCNEILLEY,
Assistant Professor of Civil
Engineering, Vanderbilt University."

MARBLE.

The marble of Alabama is of two kinds, crystalline, or true marble, and non-crystalline.

The crystalline or statutory marble occurs mainly in a narrow valley along the western border of the metamorphic area, extending from Marble Valley in Coosa County, through Talladega into Calhoun. The length of the marble belt through

Coosa and Talladega counties is about 50 miles. The width of the valley carrying the marble as a rule is from one quarter to one-half mile, widening in places to a mile and a quarter, for example in the neighborhood of Sylacauga.

The quarries longest known are Gantt's and Herd's near Sylacauga, Nix's near Sycamore, Bowie's near Rendalia, and Taylor's and McKenzie's near Taylor's Mill, east of Talladega. From all of these marble was quarried before the civil war.

During 1914 three companies reported production of marble in Alabama, viz., the Alabama Marble Company at Gantt's Quarry, the Moretti-Harrah Company, whose quarry adjoins that of the Alabama Marble Company at Gantt's, and the Eureka White Marble Quarry near Talladega Springs, but in Coosa County. The other quarries mentioned are in Talladega county, near Sylacauga.

The plant of the Alabama Marble Company at Gantt's Quarry which was completely destroyed by fire in December, 1910, has been rebuilt and equipped with all the machinery needed for the working up of any kind of finished product.

I think it is fairly safe to say that on the whole the marble from this quarry and immediate vicinity is of the highest grade of commercial white marble now on the market and obtainable in large quantity. There are small quantities of marble produced both in Italy and Vermont that are somewhat freer from coloring matter than the best grades that can be produced in Alabama in any quantity. But on the other hand, the poorest grades in Alabama greatly surpass the poorest grades produced elsewhere, so that the average of the Alabama deposit is probably somewhat higher than that of any other so far developed, not excluding even the marble from the Carara district in Italy. The marble from this State (Gantt's Quarry) has now a well established reputation and has been used in more than 200 important buildings throughout the United States.

It can be seen in the galleries of the National Museum in Washington.

The Moretti-Harrah and the Eureka Company furnish the marble in blocks for monumental and rough interior purposes.

A beautiful quality of variegated limestone or marble—red, pink and white—belonging probably to the Cambrian forma-

tion, occurs in Shelby County, a mile or two south of Shelby Springs station on the L. & N. railroad, and extending thence southwest for a mile or two. Nothing but prospecting work has been done on this marble. The Trenton limestone in the Appalachian valleys, particularly Jones Valley below Bessemer, contains marble similar to that quarried in the vicinity of Knoxville, Tenn. Also as to Pratt's ferry on the Cahaba River in Bibb County a quarry was for many years worked in this formation and turned out a very beautiful quality of marble varying in color from gray through pink, red and brown shades.

A black marble which is exceedingly promising, has been reported and some development work done near Anniston, and at Piedmont, Calhoun County, and some very handsome specimens of cave onyx have been obtained from near Kymulga in Talladega County.

In the Coastal Plain the St. Stephen limestone of the Tertiary holds ledges of hard, almost crystalline rock capable of taking good polish. The colors vary from nearly white, through shades of yellowish into red, and it would make a handsome decorative marble, especially for inside work.

Other limestone formations, such as the Subcarboniferous and the Knox Dolomite, could in places be drawn upon for marble.

For the first time in several years as many as three companies have been productive, and the value of the marble produced in 1914 (\$370,766) can be revealed.

SANDSTONE.

As may be seen in the tables below, the production of sandstone in 1914 shows an increase in total value of \$10,662, or 7.05 per cent as compared with 1913.

In the second table details of the production according to uses cannot be given for 1914, since there are in no instances three or more producers of one kind of stone.

Value of sandstone production in Alabama from 1910 to 1914.

Year	1910	1911	1912	1913	1914
Value	\$109,063	\$73,195	\$27,596	\$151,111	\$161,773

Value of sandstone production in Alabama in 1913 and 1914, according to uses.

Uses	1913	1914	Increase	Percentage
Rough Building.....	\$37,500			
Ganister				
Rubble	9,055			
Riprap	17,056			
Crushed Stone:—Concrete	87,500			
Total.....	151,111	\$161,773	+ 10,662	7.05

SUMMARY.

BECAUSE of the difference in the units of measurement employed in the various branches of the mineral industry, a summation of the production of the year can include only the values of the products. It is also to be noted that a simple summation of all the values of the minerals or mineral products listed in this pamphlet would give a value much in excess of the true value, since in many cases, as for instance, coal and coke, and iron ore and pig iron and steel, the second product is directly a product of the first, and the value of the first is included in that of the second. To give the values of both as a part of the total would be to repeat, in a measure, at least a partial value of the first or raw product, and would give an erroneous result.

As the Survey has not, however, the figures upon which to base an estimate as to the percentage of each product which was used in the manufacture of some other product, the summation of the mineral production of the State, as given here, will be a simple summation of the values reached by the individual branches of the industry.

According to this rather unsatisfactory manner of summation, which does not include the value of the steel produced, the value of the 1914 raw materials and immediately derived products, was \$56,769,559, as compared with \$67,530,089 in 1913, a decrease of \$10,760,530 or 15.92 per cent.

This production may be classified as follows:

Raw Products -----	\$30,879,288
Pig Iron -----	17,481,828
Coke -----	8,408,443
Total -----	\$56,769,559

The more important minerals and products after coal, pig iron and coke, are iron ores, clay products, stone, cement, sand and gravel and lime, given in the order of their relative values.

Below is a tabular presentation of the value of the mineral products of Alabama, as estimated above, for 1911, 1912, 1913, and 1914.

Total value of the mineral production and products in Alabama, in 1911, 1912, 1913, and 1914:

Year.	Value.
1911 -----	\$52,772,951
1912 -----	60,141,793
1913 -----	67,530,089
1914 -----	56,769,559

